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February 1971

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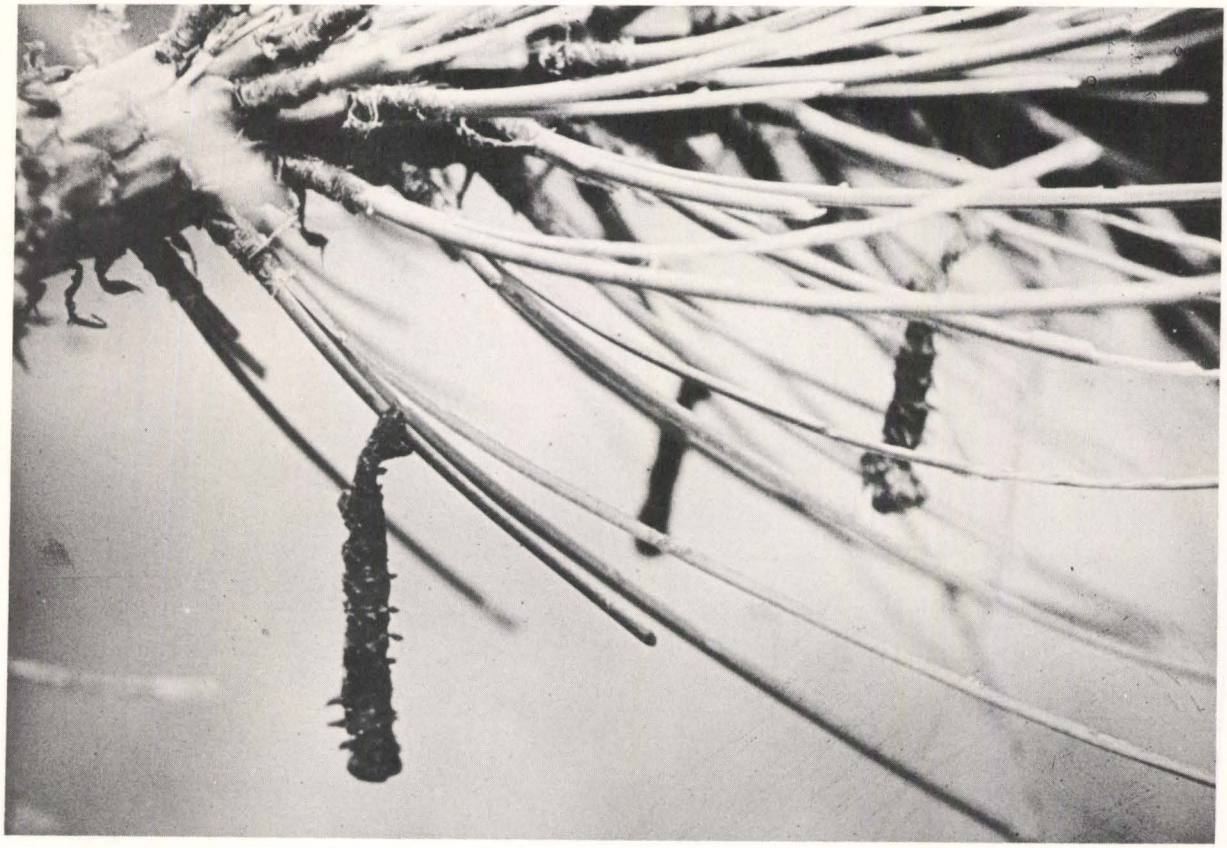

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U.S. Department of Agriculture – Forest Service
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STATUS OF THE PINE LOOPER IN SOUTHEASTERN MONTANA, 1970

By

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ABSTRACT

The looper, Phaeoura mexicanaria (Grote), infestation in southeastern Montana intensified and spread to over 63,000 acres in 1970. A bacterial pathogen caused a complete collapse of the infestation by the end of the summer. Looper defoliation predisposed many of the trees to attack by Ips calligraphus (Germar).

INTRODUCTION

A looper, Phaeoura mexicanaria (Grote), caused serious defoliation to ponderosa pine in eastern Montana in 1969 (Dewey, 1970)[1/]. Trees of all size and age classes were defoliated on about 25,000 acres of the Custer National Forest and Northern Cheyenne Indian Reservation. Defoliation varied from light to complete removal of the needles. The infestation intensified and spread to over 63,000 acres in 1970.

The insect overwinters as a pupa. Moth flight begins near the first of July and continues about 10 days. Eggs are deposited on the needles or branches and hatch in about 2 weeks. Larvae feed on both old and new foliage.

An evaluation was initiated in 1970 to:

1. Collect biological data for predicting infestation trends.

2. Evaluate the impact of the infestation on the pine stand.

3. Remap the infestation to determine changes in acreages defoliated and infestation boundaries.

METHODS AND PROCEDURES

Egg sampling.--An egg survey was conducted in four infested areas shortly after moth flight (fig. 1). Six plots were established at each area. A plot consisted of three trees, one over 40 feet high, one from 20 to 30 feet in height, and one between 6 and 8 feet high. Two full branch samples were examined for egg masses from each of three crown classes (upper one-third, middle one-third, bottom one-third) on each of the larger trees. The

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1/ Dewey, Jerald E. A pine looper, Phaeoura mexicanaria (Grote), outbreak in eastern Montana. U.S. Forest Service, Northern Region, Div. S&PF (unpublished report, 7 pages), 1970.

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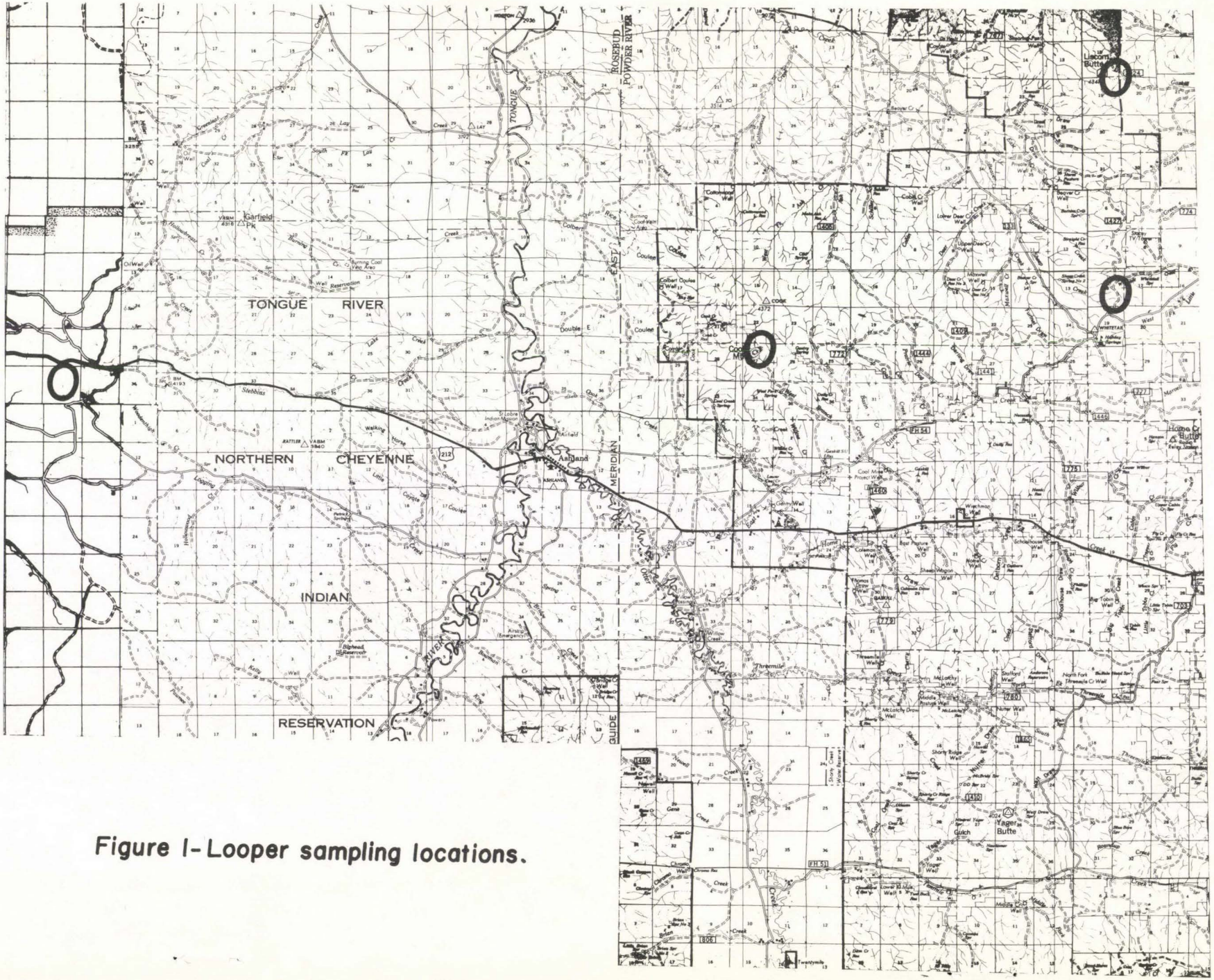

Figure 1- Looper sampling locations.

entire small tree was checked for eggs without attempting to differentiate crown levels. Square inches of foliage were measured on each full branch sample. The number of egg masses found and the location on the branch were recorded. Eggs per mass were counted as well as hatching success.

Larval sampling.--A larval survey was made in late August after most of the larvae had reached later instars. Counts were made at the same plot areas as the egg samples. A total of 34 plots were sampled. At each plot two 20- to 30-foot trees and a 6- to 8-foot tree were sampled. Trees could not exceed 30 feet in height to permit the use of a 24-foot pole pruner with attached basket for catching the samples. A sample consisted of two 18-inch branches from each of the three crown classes per tree, plus the entire 6- to 8-foot tree. All larvae were counted and checked for visible parasite or disease symptoms. The most common evidence of parasitism was a white egg on the exterior of the looper larva (fig. 2).

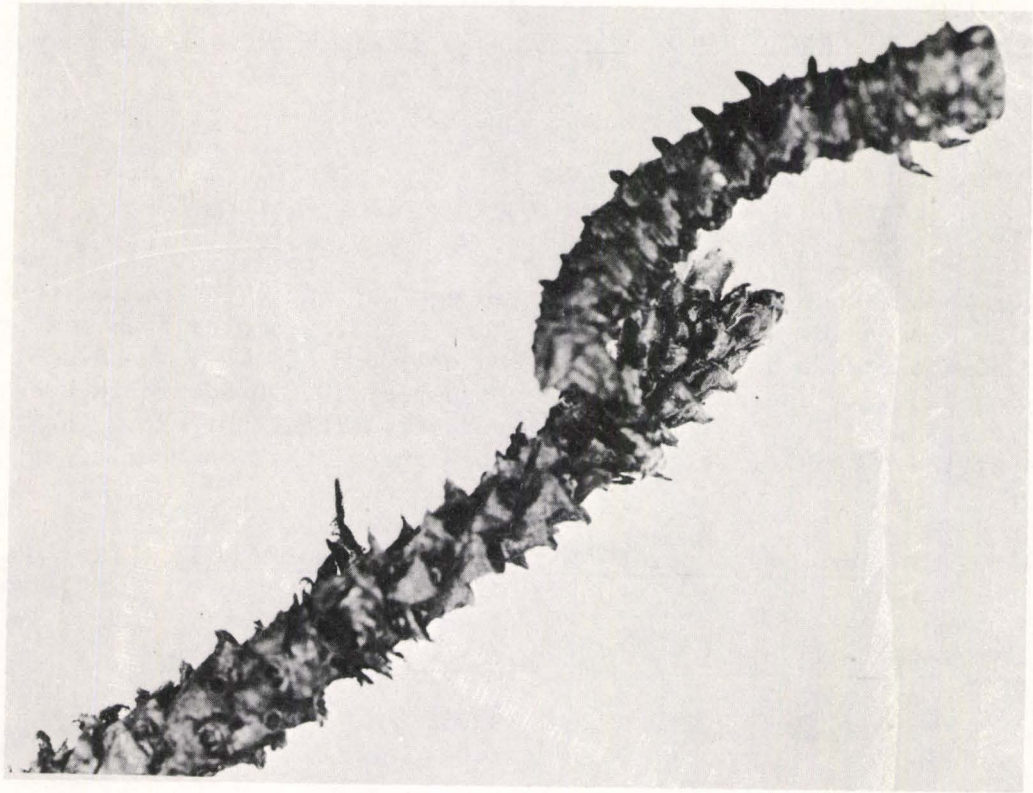

Figure 2.--Looper larva resting on twig. Note parasite eggs near middle and anterior end of larva.

Damage survey.--An aerial survey was made in mid-October to map the intensity and the boundaries of the infestation. Ground checks were made to verify the intensity ratings of the aerial survey.

In November, a variable basal area cruise was conducted on the Cook Mountain area. This gave an analysis of the degrees of defoliation.

RESULTS

Egg distribution.--A total of 72 trees were sampled for egg mass distribution. There was a preference for the upper two-thirds of the larger trees for oviposition sites (table 1).

Table 1.--Distribution of pine looper egg masses on ponderosa pine by tree size and crown level, southeastern Montana, 1970

Tree size (feet)	Upper crown	Midcrown	Lower crown	Total
+40	56	76	14	146
20-30	5	10	6	21
6 -8	--	--	--	13
Total	61	86	20	180

Samples from 26 of these trees contained 180 egg masses. Nineteen of the 26 trees with egg masses were the plus-40-foot trees. Samples from six of the 20- to 30-foot trees had egg masses, and only one of the 6- to 8-foot trees had egg masses. The number of egg masses per 10,000 square inches of foliage varied appreciably by crown level and tree size (table 2). The top two-thirds of the plus-40-foot trees contained the greatest number of egg masses.

Table 2.--Egg masses per 10,000 square inches of foliage

Tree size (feet)	Upper crown	Midcrown	Lower crown
+40	10.67	9.05	1.40
20-30	1.60	2.02	1.22

The eggs are laid on needles, twigs, and branches. Counts of 104 egg masses revealed an average of 160 eggs per mass and a range of 15 to 498 eggs per mass. Laboratory-reared unmated females averaged 345 total eggs. From this it appears that some moths deposit nearly all their eggs in a single mass while others lay two or more masses. Eleven egg masses failed to hatch or contained significant numbers of unhatched eggs, giving a field hatching success of 89.4 percent.

Larval sampling.--A total of 1,439 larvae were collected during larval sampling. Forty-six percent of the larvae from the 20- to 30-foot trees was on the upper crown, 39 percent was from midcrown, and 15 percent from

from bottom crown (table 3). Upper crown samples averaged 3.97 larvae per 18-inch branch; midcrown samples averaged 3.43 larvae per branch; and bottom crown averaged 1.32 larvae per branch. The 6- to 8-foot trees averaged 7.38 larvae per tree.

Table 3.--Larval distribution and condition

Crown level	Apparently healthy larvae	Diseased larvae	Parasitized larvae	Total
Upper crown	359	170	12	541
Midcrown	314	137	16	467
Lower crown	104	70	6	180
Small tree	151	94	6	251
Total	928	471	40	1,439

Diseased and parasitized larvae were common throughout the entire infestation.

Thirty-two percent of all larvae examined during August 18-21 showed disease symptoms, and 3 percent were conspicuously parasitized. By the end of August it was almost impossible to find a live larva because of disease. Attempts were made in October and November to collect pupae, but no live pupae were located because the disease had caused a complete collapse of the infestation. Diseased larvae were found infected with a small bacterium.[2/]

Location and intensity of 1970 defoliation.--Results of aerial surveys indicate that 63,000 acres were defoliated in 1970. Over 59,000 acres were on Indian Reservation land. About 20,000 acres were heavily defoliated and 43,000 acres light to moderately defoliated. This is an increase of approximately 38,000 acres over 1969.

The basal area cruise on Cook Mountain indicated 98 percent of the trees in the 1,920-acre survey area suffered defoliation. Forty-four percent was completely defoliated, and 54 percent partially defoliated. The defoliation predisposed many of the trees to attack by bark beetles. Over 70 percent of the completely defoliated trees were attacked by beetles.[3/]

2/ Disease organism identified by Kenneth M. Hughes, Insect Pathologist, Pacific Northwest Forest and Range Experiment Station, Corvallis, Oregon, and confirmed by Gerard M. Thomas, University of California, Berkeley, California.

3/ Dewey, J. E., W. M. Ciesla, and H. E. Meyer, Evaluation of an engraver beetle, Ips calligraphus (Germar), following pine looper defoliation on the Ashland District, Custer NF, Mont. Unpublished report, U.S. Forest Service, 1971.

DISCUSSION

One of the objectives of the study was to collect data for predicting infestation trends. Although egg and larval samples were collected, there will be no way to correlate the data with infestation trends due to the collapse of the infestation. This data may be useful if there is a resurgence of the infestation in future years.

The larval sample counts were probably much lower because of the disease than they would have been had they been collected a week or two earlier. It was common to find many dead larvae on the ground during larval sampling. Areas of very heavy defoliation had almost no live larvae remaining during larval sampling, for they had nearly all died from disease or competition. Highest larval counts were in areas of light to moderate defoliation.

The disease appears to have been extensive enough to result in a collapse of the infestation. Noticeable defoliation is not expected in 1971. How long the population will stay down or whether it will ever reach epidemic levels again is not known.